Heterochrony and size reduction in the dentition and hands of Callitrichinae. J.C. BICCA-MARQUES[1], S.A. WOJCIECHOWSKI[2], and S.R. LEIGH[1], [1]Department of Anthropology, University of Illinois, Urbana, and [2]Brookfield Zoological Park, Brookfield, IL

Several studies have investigated the causes and consequences of size reduction in small-bodied New World monkeys. Size reduction may have especially important implications in terms of skeletal and dental proportions. Specifically, size reduction may produce new proportions that reflect or enable novel adaptations. Consequently, we evaluate questions regarding evolutionary changes in size and shape in the dentition and hands of callitrichines.

Dental and body weight data based on literature sources are analyzed, along with new data representing hand dimensions. Diagnoses of heterochronic processes are aided by investigation of body weight growth data. We employ both regression and ratio-based measures of proportions to identify heterochronic processes.

Analyses of dental proportions are consistent with previous studies, and indicate that cebid-like proportions are maintained in the dentition of callitrichines. Body weight growth data show a general pattern of rate differences among taxa, suggesting that evolutionary decreases in growth rates account for dwarfing of these taxa. A smaller sample of genera reveals heterogeneous patterns of shape change in hand morphologies. Relative to *Saimiri* and *Aotus*, some callitrichine hands have undergone changes in shape. In comparison to these genera, two heterochronic processes appear to describe size changes in callitrichines. These are proportioned dwarfism in *Cebuella*, *Callithrix*, *Callimico*, and some *Saguinus* species, and acceleration in *Leontopithecus* and other *Saguinus* species. These results illustrate the complexity of size reduction in neotropical primates. The heterochronic bases of adaptation, particularly in hand morphologies, are discussed.

COMPARATIVE study of East African Pliocene omnivore dental microwear. L.C. BISHOP[1], T. KING[1,2], & B. WOOD[1,3]. [1] HPRG, Department of Human Anatomy and Cell Biology, The University of Liverpool, Liverpool L69 3GE, UK. [2] The Natural History Museum, London SW7 5BD, UK. [3] George Washington University, Washington D.C. 20007.

Diet is one aspect of ecology that can be studied in extinct taxa. In omnivorous taxa such as Hominidae, feeding ecology may differ between species so that numerous species can coexist in time and space. This study investigates dietary differences in another omnivore family - the Suidae (Old World Pigs) - through an examination of dental microwear. The Suidae experienced a large evolutionary radiation during the Pliocene and Pleistocene contemporaneous with a similar radiation in the Hominidae.

The molar microwear of *Kolpochoerus* (3 species), *Nyanzachoerus* (3 species), and *Notochoerus* (3 species) from East African sites ranging from 6 Ma to 1 Ma were examined in this study. The microwear patterns of these fossil species were compared with those of three extant African suid genera - *Hylochoerus*, *Phacochoerus*, and *Potamochoerus*. *Nyanzachoerus* and *Notochoerus* went extinct without issue, so comparisons with modern pigs are based on ecological rather than phylogenetic grounds. Two occlusal wear surfaces per specimen were examined using a scanning electron microscope in back-scattered mode. Images were captured digitally from the electron microscope and downloaded onto computer, and microwear was analysed using a semi-automated image analysis program. Results indicate a variety of microwear patterns in contemporaneous fossil species, suggesting that they exploited different diets. The range and variation of their diets provide useful information about strategies for omnivory available to hominids during the Pliocene.

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Mother's helper: Girls' contributions to domestic work among the Toba. R.M. BOVE, C. VALEGGIA, and P.T. ELLISON, Harvard University, Cambridge, MA.

Since girls in many societies are socialized at a young age to help in their home, their contribution to child care and domestic activity might serve an important role in modulating lactating women's energetic burden. A two-month preliminary study carried out among Toba girls from the Chaco region of Argentina and Paraguay was designed to (1) characterize the involvement of Toba girls in child care and domestic activities and (2) determine whether their presence in the household affects the activities, breastfeeding patterns, and energetic workload of lactating mothers.

In part (1) of the study a sample of fourty girls aged 3 to 15 was selected. Their anthropometric data and household composition were recorded. Rounds of spot observations of the girls' activities were then carried out at different times during the day. Over 900 data points were obtained, and the data are being analyzed to determine the extent of involvement and age patterns in helping behavior. It is found that girls do spend a considerable amount of time engaged in domestic tasks, and that even from a young age they serve as baby minders while the older women in the household perform other tasks.

In part (2) focal observations of the household activities, breastfeeding events and energetic budget, and frequency of work interruptions to care for the baby, were conducted for twenty lactating women. Ten of these women lived in a household that contained at least one girl aged 8-15 and ten did not. Each mother was observed for one four-hour morning session and one four-hour afternoon session. Preliminary results indicate that women who live in households with young girls spend less time caring for their babies, although they still practice on-demand breastfeeding in a pattern similar to women who do not live with girls.

On The Non-Clinal Nature of Human Cognitive Capabilities. C. L. BRACE, University of Michigan, Ann Arbor, Mi 48109

In the appraisal of living human populations, it can be taken as a general rule that traits under selective force control are distributed in clinal fashion according to the distribution of the relevant individual selective forces. These distributions are not constrained by the boundaries of populations or regions and cannot be understood if socially defined categories such as "races" are taken as the starting points for analysis.

"Environmental determinists" from Ellsworth Huntington (1924:1) to Arthur R. Jensen (1969:80) and J. Philippe Rushton (1995:4) have taken it as a given that "the idea of a genetic difference" between the intellectual capabilities of living human groups "is not an unreasonable one" (Neary 1970:62). However, this expectation is indeed "unreasonable" when the relevant range of anthropological data are treated in the context of the time available and in the perspective of evolutionary theory.

The attempt to invoke a correlation between cognitive capabilities and differences in the "civilizations" with which various human groups are associated fails to note that no current "civilization" has a time depth of more than a few hundred -- or at most, a few thousand -- years. In contrast, it is evident that the span of 11,000 plus years that the original inhabitants have been in the western hemisphere is not sufficient to have produced a gradient in skin pigmentation between the arctic circle and the equator.

Throughout the preceding Pleistocene, the archaeological record provides clear evidence that the mode of subsistence of all human populations was essentially the same throughout the entire range of human occupation. Within the past 200,000 years or so, this was conditioned by adaptation to the selective pressures engendered by the cultural ecological niche. For these reasons, then, cognitive capabilities should not be clinally distributed and should be the same in all the living populations of the world.

What do carotid canals tell us about human brain evolution ? J. BRAGA and J.J. HUBLIN, UMR 152 of CNRS, Musée de l'Homme, Place du Trocadéro, 75116 Paris, France.

Valuable information on the volume of arterial blood supply to the cerebral hemispheres can be obtained by measuring a bilateral osseous structure : the carotid canal. A scaling analysis was conducted in extant humans and common chimpanzees to understand the underlying functional relationship between absolute brain size (from which the cortical volume is highly predictable) and the « carotid section area » (CSA = sum of the sectional areas measured on the right and left carotid canals). External and endocranial measurements were taken by respectively using a digital caliper and computed tomography.

In extant humans, the CSA has a clear allometric relationship with the endocranial volume. The correlation is highly significant (p=0.000). In common chimpanzees, the distribution is quite different, with no significant correlation between CSA and the endocranial volume. These two anatomical patterns reflect two distinct patterns of blood supply to the brain.

Using these results, a scaling analysis of fossil hominids of known endocranial volume allowed us to determine when the human pattern of the carotidian circulation gained importance in exclusively supplying the cerebral hemispheres. Representatives of *Homo erectus sensu lato*, Neandertals and early modern humans are within the confidence limits associated to the extant human logarithmic linear equation. At least in these groups, proper application of our allometric analysis to the size of the carotid canals reveals itself to be of great value to predict the endocranial volume in hominids with only parts of their skull base preserved. Specimens assigned to *Australopithecus* (MLD 37/38, STS 5, AL 333-105, AL 333-45) and *Paranthropus* (KNM-ER 732, KNM-WT 17000) display quite different scaling trajectories from both *Homo* representatives and common chimpanzees. In light of these results, the presence of the human pattern in some Pliocene hominids of debated taxonomic attribution is discussed.

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Incest avoidance and structured mating behaviors in the context of sexually transmitted diseases. C. A. BRAMBLETT and S. S. BRAMBLETT, Department of Anthropology, The University of Texas, Austin, TX 78712.

Social groups of Sykes' monkeys (Cercopithecus mitis kolbi) and vervet monkeys (Cercopithecus aethiops pygerythus) were housed at The University of Texas from 1968 until 1986, when the colony was reduced to a single mixed taxa group. This mixed group was maintained until 1997. The Sykes' group and the post-1986 mixed taxa group of Syke's monkeys, vervets, and hybrids were dominated by a single Sykes' female (Orange) until 1993.

This paper presents summaries of sexual activity in three contexts - prior to 1986, from 1986 to 1993, and 1994 to 1996.

Records of sexual behavior indicate a highly structured mating pattern that reflects strong incest avoidance. A sexually transmitted SIV is present among the Sykes' monkeys. The absence of the sexually transmitted disease in many members of the group is hypothesized to reflect the structured pattern of sexual activity.

A sexually transmitted disease that is not transmitted from mother to infant may add selection pressure against incestuous behaviors since incest avoidance insulates both male and female progeny against one source of the disease.

Data collection and analysis are supported by the Department of

Anthropology and the College of Liberal Arts at The University of Texas. Thanks to numerous students whose classwork permits a long-term look at a guenon group.

Isotopic evidence for paleodiet in Michigan. K. L. BRANDT. State University of New York at Albany. Department of Anthropology. Albany, New York 12222.

In order to clarify the diet of native North Americans in Michigan from the Late Archaic through the late Late Woodland, carbon and nitrogen stable isotope ratios are determined for 43 individuals from ten sites in Michigan. The collagen extraction and stable isotope measurement were performed by Schoeninger's laboratory at the University of Wisconsin.

The stable isotope ratios of carbon and nitrogen can be very helpful in determining some aspects of paleodiet. Carbon stable isotope ratios in collagen can be used to determine when maize became a part of the diet and how important it was to the diet. Michigan lies at the northern edge of effective maize agriculture and some areas are more conducive to growing maize than others. Thus, carbon stable isotope analysis can clarify this part of the diet. In contrast to carbon stable isotopes, analysis of nitrogen stable isotopes should give an indication of the variation and extent of Great Lakes fish utilization. Prior to this study carbon and nitrogen stable isotopes had been determined for only one site in Michigan.

There is both regional and temporal variation in carbon stable isotope ratios. Prior to the Late Woodland period, no site shows evidence of maize use. During the Late Woodland, there is regional variation in carbon stable isotope ratios. In the early Late Woodland, individuals from sites in southeastern Michigan have carbon stable isotope ratios that show considerable reliance on maize whereas those from the rest of Michigan have values that indicate essentially none. During the later part of the Late Woodland, all sites show some use of maize although not as extensive as in southeastern Michigan.

Most of the individuals from Michigan have nitrogen stable isotope values indicating that fish was not an important part of their diet. Only individuals from two northern sites have nitrogen stable isotope values indicating heavy reliance on fish. Thus heavy use of Great Lakes fish seems to have a limited distribution.

New reconstruction of the Middle Pleistocene skull of Steinheim (Baden-Württemberg, Germany). M. BRAUN (Neuroradiology and Anatomy Dpt., Nancy University, France, J.J. HUBLIN (UMR 152 of CNRS, Paris, France), and P. BOUCHER (CRIN-LORIA, Nancy, France).

The human skull found, in 1933, in the Sigrist Quarry is one of the most prominent Middle Pleistocene European fossils. Assigned to the " Holstein interglacial ", it could be contemporary with the isotopic stage 9. While it was never described in great detail, this fossil played a central role in various evolutionary models. It has often been interpreted as a " presapiens " ancestral to modern Europeans or as a representative of " *Homo heidelbergensis* ", predating the divergence between the Neandertals and modern humans ancestors. Indeed its morphology appeared to contrast with other European Middle Pleistocene hominids. In particular, its infraorbital area, its occipital and the outline of its cranial vault in posterior view were considered, in some aspects, to display " modern " characteristics. A close examination of the specimen demonstrates it suffered a strong bilateral compression in the sedimentary deposit, resulting in displacements of fragmented elements and some level of plastic distortion. A 3D image of the specimen was acquired by computed tomography. By using the software gOcad®, we have been able to propose a new reconstruction of the specimen. Plastic distorsions have been corrected. Anatomical continuity between the displaced elements as well as the initial symmetry have been restored. After reconstruction, the skull displays a broader base and stronger prognathism. By its detailed anatomy and general architecture, the Steinheim hominid inserts itself amidst the contemporary Middle Pleistocene European specimens as an early member of the Neandertal lineage.

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The skeletal biology of pellagra with intensive maize horticulture in the New World. BP BRENTON, Soc., & Anthrop. dept., St. John's University, New York & RR PAINE, Soc., Anthrop., & SW dept., Texas Tech University, Lubbock, TX

Pellagra, a niacin deficiency disease, has historically been linked to high maize diets. Tissue and behavioral symptoms include the 3 D's: dermatitis, diarrhea and dementia. The social history of this disease is extensive, yet to date little research has focused on pellagra-related skeletal pathologies, such as the rarefaction of bone.

Convention suggests that New World peoples were protected from the disease by ubiquitous alkali processing techniques using lime or ash which increased the bioavailability of niacin from maize. For this reason the first descriptions of pellagra were in Old World peasant populations from Italy and Spain, who consumed high maize diets without the benefit of an alkali culinary tradition.

We propose a rethinking of assumptions about the paleopathology of intensive maize horticulture in the New World that includes a discussion of pellagra. Specifically: (1) introducing models that examine the impact of pellagra on bone tissue, (2) examining the effect of other micronutrient deficiencies, such as iron and zinc, on the course of pellagra, (3) challenging the efficacy of a nutritional synergism existing in diets composed of maize, beans, and squash, and (4) understanding the implications of alkali processing on prehistoric diet and health.

Our paper also explores the potential for using bone histology to discover a link between skeletal remodeling and niacin deficiency. To create base line expectations we will use bone samples from chronic alcoholics who show symptoms of pellagra.

Couple conflict, reproductive strategy, and fertility in three Micronesian island populations. A.A. BREWIS, Department of Anthropology, University of Georgia, Athens, GA30602-1619.

The use of biomedical contraceptives allows individuals or couples to engage in complex reproductive strategies, attempting deliberate control over occurrence and timing of pregnancies. Such contraceptive strategy can be characterized variously as mutually constrained or in conflict between partners, or cooperative or mutually reinforcing, and these can be predicted to show life history variation for women and men, although not necessarily at the same times or in the same direction.

Life history and gender aspects of contraceptive strategy and birth scheduling are examined among married couples on three small islands of the Tungaru chain of the Micronesian nation of Kiribati, where biomedical contraceptive use is characteristically sporadic across reproductive lives and fertility is high. Focus groups (N=36) were used to derive normative and contextual data. Semi-structured house-to-house interviews with ninety-eight couples assessed reproductive history and behaviors, and past, present and anticipated strategy. Husbands and wives were interviewed separately.

Men prefer to have children more closely spaced than women. Husbands are more likely to choose non-cooperative strategies earlier in marriage, whereas wives are more likely to risk pursuing a non-cooperative strategy with increasing age and number of children. However, the majority of couples act to reduce potential conflict and increase couple accord in fertility scheduling and contraceptive use. Particularly, many husbands cooperate broadly in fertility decision-making and activities, including about timing and number of births, despite a cultural context that supports and legitimizes pursuit of a non-cooperative male strategy. Non-cooperative husbands have lower apparent fertility (represented as longer birth intervals) than cooperative husbands. Non-cooperative wives also have longer birth intervals, reinforced by opportunity to use contraceptives without a husband's knowledge.

When did sexual dimorphism appear in the brain's interhemispheric highway?

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The corpus callosum is the major interhemispheric pathway in the brain, making it a focus of speech, vision, and handedness studies. An important question regarding the corpus callosum (CC) concerns the existence of sexual dimorphism. Studies on humans have shown the presence of sexual dimorphism. However, its existence in the CC of nonhuman primates, including the great apes, has received little attention.

In our ongoing study of the CC we examined its midsagittal area in 12 adult female and 11 adult male common chimpanzees, *Pan troglodytes*. Measurements included total CC midsagittal area and area measurements of callosal subsections (splenium, isthmus, midbody, genu, and rostrum). Two techniques were used. 1) In the radial line method a line from the anterior and posterior extremes of the CC was drawn tangent to the ventral border. The midpoint of this line was defined, and 6 callosal segments were constructed by rotating the ventral line every 30^0 from 0^0 through 180^0 using the mid-point of the line as the axis of rotation. 2) In the straight line method parallel lines were drawn tangent to the anterior and posterior extremes of the CC and connected by horizontals perpendicular to the verticals. The horizontal straight line distance between the anterior and posterior endpoints was calculated and the CC divided into 5 subregions by constructing 4 equidistant lines perpendicular to the horizontal lines. For both methods, the area of the CC and each subsection were calculated to assess statistically significant differences in absolute area and relative callosal area between males and females.

Analysis shows that there is no statistically significant ($p > 0.10$) sexual dimorphism in the corpus callosum of the common chimpanzee. In addition, there is no statistically significant sexual dimorphism in any subarea of the corpus callosum using either the radial line or the straight line methods. These findings differ from previous results which utilized smaller sample sizes. The lack of sexually dimorphic callosal differences in the closest living relative of humans indicate that sexual dimorphism in this region of the brain may not have occurred until after the ape-human split. These findings suggest that dimorphism in certain human abilities, such as language, may only have begun with the appearance of the hominin line.

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Androgen-behavior interactions in free-ranging female *Propithecus verreauxi*. D.K. BROCKMAN[1], P.L. WHITTEN[2], and H. BEAUPRE.[3] [1]Department of Biological Anthropology and Anatomy, Duke University, Durham, NC 27708, [2]Departments of Anthropology and Biology, Emory University, Atlanta, GA 30322, [3]Population Biology and Evolutionary Ecology Program, Emory University, Atlanta, GA 30322.

Female social dominance is rare in mammals, occurring in only a handful of species under diverse ecological and social

circumstances. Investigations of spotted hyenas (*Crocuta crocuta*) suggest that female social dominance results from a complex array of androgen-behavior interactions, associated with androgen-mediated female aggression, male dispersal, and intolerance of strangers (Frank et al., 1986). Female lemuriformes socially dominate males by consistently displacing them from preferred feeding sites, but the androgenic factors mediating this and other intersexual relationships remain unknown. In this study we used fecal steroid analysis to examine androgen-behavior interactions associated with sex, reproduction, rank, and intersexual competition in free-ranging female *Propithecus verreauxi*.

Behavioral and hormonal data were collected from two social groups during the 1990-91 and 1991-92 breeding seasons at Beza Mahafaly, Madagascar. Solid phase and radioimmunoassay techniques were used to quantify testosterone in 485 desiccated fecal samples collected daily from five female sifaka.

Results suggest that there are intra- and intersexual differences in fecal testosterone (fT) levels, socially dominant females exhibiting weeks where T levels are as high or higher than those observed in males. Some females exhibit a triplet increase in fT that precedes and spans estrous-related estradiol elevations. Moderately elevated fT levels coincide with pregnancy elevations in fecal ovarian steroids, peak levels coinciding with hormonal evidence of abortion. Fecal testosterone concentrations parallel scent-marking behavior in both males and females and may be linked to the patterning of mating and aggression over the breeding season.

The relationship between ambulatory blood pressure and body composition in Japanese-American school teachers in Hawaii: Preliminary results. D. E. BROWN, S. L. AKI, M. B. ETRATA, G. M. NAPIHA'A, Anthropology, University of Hawaii at Hilo, Hilo, HI 96720, and G. D. JAMES, Cardiovascular Center, Cornell Medical Center, NY, NY 10021.

Ambulatory blood pressure (BP) measurements were recorded of 37 female teachers of Japanese-American ethnicity working in public schools located in Hilo, Hawaii. BP was measured at 15 min intervals during waking hours and 30 min intervals during sleep over a 24 hr period that included a full work day. These measurements were averaged during three daily settings: at work, at home while awake, and during sleep. Anthropometric measures included: stature; weight; circumferences at mid-arm, waist and hip; and skinfolds at triceps, biceps, calf, subscapular and suprailiac sites. Body mass index (BMI), sum of skinfolds, waist-to-hip circumference ratio and mean trunk-to-limb skinfold (TL) ratio were computed. Mean systolic BP was significantly correlated with sum of skinfolds in the work ($r=0.41$, $p=0.01$) and home ($r=0.38$, $p < 0.05$) settings, but not during sleep ($r=0.29$, ns). Mean systolic BP was significantly correlated with BMI only in the work setting ($r=0.34$, $p < 0.05$). Mean diastolic BP was not significantly correlated with sum of skinfolds or with BMI in any time period. The waist-hip ratio was not correlated with mean BP in any setting, but the TL ratio was significantly correlated with mean systolic BP in all three settings (work: $r=0.0.32$, $p < 0.05$; home: $r=0.44$, $p < 0.01$; sleep: $r=0.34$, $p < 0.05$). This relationship remains significant when BMI and age were controlled in multiple regressions for the home setting, but not for the other two settings. Systolic BP appears to be related to fatness and fat distribution during certain, but not all, periods of the day in these Japanese-American women.

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Subadult skeletal pathology at a prehistoric site on Taumako Island, Solomon Islands, Melanesia. H. BUCKLEY, University of Otago, Dunedin, New Zealand.

In 1977-78 a substantial skeletal sample ($n=204$) was excavated from the pre-historic burial mound of Namu, Taumako Island, Solomon Islands, Melanesia. The burial mound was utilised between AD 1250 and AD 1600. Of the thirty three subadults (under 20 years of age) in the sample, twenty seven were found to exhibit evidence of inflammatory and/or anaemic disease. The skeletal and dental evidence of subadult disease at Taumako is assessed and the results are presented. The problems of differential diagnosis of the inflammatory and anaemic changes in subadult material are discussed. The patterns of skeletal lesions found in the adult material are synonymous with published accounts of treponematosis. Diffuse periostitis of the appendicular skeleton, particularly the tibiae, and inflammatory lesions of the face, indicative of goundou, support the conclusion that the disease affecting the subadults is also treponemal. Skeletal lesions of this type, in this region and at this time in history suggest the aetiologic agent is yaws (*Treponema pertenue*) rather than other treponemal conditions. However, the correlation of prenatal enamel developmental defects and skeletal inflammatory changes in subadults may allude to a transplacental transmission of disease, which is believed to be a characteristic of genital syphilis alone. However, the apparent lack of osteochondritic lesions in subadult long bones precludes a diagnosis of congenital syphilis. Therefore, it is argued that the epidemiology of the disease at Taumako may support the 'Unitarian Hypothesis' of treponemal evolution. The possible routes of introduction and the antiquity of treponemal infection in the Pacific are discussed.

How much is too much? Examining the effect of dental wear on studies of dental morphology. S.E. BURNETT, Department of Anthropology, Arizona State University, Tempe, AZ 85287, J.D. IRISH, Department of Anthropology, University of New Mexico, Albuquerque, NM 87131, and M.R. FONG, Department of Anthropology, Arizona State University, Tempe, AZ 85287.

Common practice has been to exclude teeth with excessive wear from studies of discrete dental traits.

However, the subjective decision on what constitutes "too much wear" can potentially lead to biases in sampling and scoring of morphological dental traits. Our study sought wear-related biases in dental trait data collected by two observers (JI,MF) from a skeletal sample of 129 Nubians from the site of Semna South. Data on four dental traits (UC distal accessory ridge, LM2 cusp number, UM2 hypocone, UI1 shoveling) were grouped into wear classes by a third observer (SB) using the system described by Smith (1984). For each observer's data set, trait presence/absence frequencies were calculated for each wear stage and compared using univariate analyses.

Most traits were scored as having lower trait presence frequencies in the high wear groups although the differences were not always statistically significant. Traits exhibiting significant differences ($p<.05$) were LM2 cusp number (JI) and UI1 shoveling (JI). UC distal accessory ridge (JI) and LM2 cusp number (MF) exhibited more equivocal differences with p values approaching statistical significance ($p<.10$). However, these latter traits displayed frequency differences of up to 35% between high and low wear classes, suggesting that important biases exist nonetheless. Data gathered on UM2 hypocone may exhibit the only difference between observers. No trend was observable in one data set (JI; $p<.50$), while the other (MF) exhibited a potential directional bias that was not quite statistically significant ($p<.10$).

Despite the effort to eliminate teeth with "too much wear" from the sample, our results indicate that even minimal to moderate tooth wear may have a significant effect on the scoring of morphological dental traits. Furthermore, biases may differ between observers, dental traits, or even trait loci. We suggest that comparisons of trait frequencies from samples with differing degrees of wear could be inaccurate and that more objective sampling procedures may need to be implemented to increase sample validity.

Comparative dural venous sinus morphology in congenital coronal synostosis. A.M. BURROWS, Slippery Rock University, Slippery Rock, PA 16057, V.D. O'LOUGHLIN, Indiana University, Bloomington, IN 47405, T.D. SMITH, Slippery Rock University, Slippery Rock, PA 16057, M.P. MOONEY, H.W. LOSKEN, M.I. SIEGEL, University of Pittsburgh, Pittsburgh, PA 15260.

This study uses a congenital animal model of coronal synostosis to investigate the relationship between altered craniofacial growth patterns and dural venous sinus morphology. Artificial cranial deformation and congenital craniosynostoses both affect craniofacial growth and morphologies in similar ways. Recent studies have revealed that cultural cranial deformation also has affects on endocranial vasculature. However, the relationship of congenital synostoses to endocranial vasculature is not as clear. The hypothesis that crania with congenital coronal synostosis display significantly different dural venous sinus patterns than normal crania is tested here. Silicone rubber endocasts from 34 adult New Zealand white rabbits were made, 22 from normal rabbits and 12 from rabbits with congenital coronal synostosis (five bilaterally and seven unilaterally synostosed). Impressions of the superior sagittal and transverse sinuses, and the confluens of sinuses were quantitatively and qualitatively assessed for depth, width, area, and symmetry. Results of Student's t-tests for independent samples showed that rabbits with complete coronal synostosis had significantly ($p<0.05$) narrower transverse sinuses, and significantly less area for the confluens of sinuses than normal rabbits. Endocasts from rabbits with complete unilateral synostosis showed marked asymmetry in the superior sagittal sinus, and in the confluens of sinuses. In addition, both superior sagittal and transverse sinuses appeared to be deeper in synostosed rabbits than in normal ones. These results may reflect increased intracranial pressure and altered craniofacial growth vectors in congenital craniosynostoses.

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The skeletal biology of the lower Mississippi river valley. SN Byers, Department of Anthropology, University of New Mexico, Albuquerque, NM 87131

Over human 400 burials from prehistoric Louisiana were studied to determine population bioarcheological parameters. Four sites dating from approximately 400 B.C. to A.D. 1200 provided the sample: Little Woods, Lafayette Mounds, Crooks Mound and Greenhouse. Although excavated in the late 1930s and early 1940s, the osteological material from these sites has never been studied systematically until now. All standard skeletal biological attributes were investigated including demography, non-metrics, metrics, dental characteristics, paleopathology and cultural modifications. Several findings of importance emerged. First, tooth wear was excessive but little calculus and few caries were found. Second, both porotic hyperostosis and "generalize bone disease" were endemic, with some sites having 100 percent of the burials exhibiting one or the other of these conditions. Third, both cranial flattening and trauma increased through time. Fourth, few subadults were found, reflecting either an "older" demographic profile or merely differential preservation. Implications of these findings for life among these prehistoric peoples are discussed.

Activity-related sexual dimorphism and prehistoric subsistence strategies in the American Midwest.
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Sexual division of labor is an integral part of most subsistence economies. This study investigates sex differences in three prehistoric midwestern U.S. groups

using musculoskeletal stress markers (MSM), activity-related morphological changes on bone at the attachment sites of muscles and ligaments. Fifty-five MSM were recorded from six skeletal elements.

The three prehistoric groups represent both different time periods and cultural associations: Green River Archaic, Middle Woodland period Ohio Hopewell, and Late Prehistoric Fort Ancient. The subsistence strategies are known for both the Archaic group (hunter-gatherers) and the Fort Ancient group (maize agriculturalists). To date, determining the subsistence strategy for Ohio Hopewell has been problematic, although it is known that it included some horticultural products.

Statistically significant differences between sexes were found within each group. In the Archaic group, males have significantly higher scores for over 90% of the MSM. In the Fort Ancient group, less than a third of the mean MSM scores vary significantly by sex, and many of the higher mean scores are among females. Among the Hopewell, approximately one quarter of the MSM show significant sex differences, generally with males having the higher scores. While Fort Ancient and Hopewell have a similar frequency of sexually dimorphic MSM, the actual MSM sites which are significantly different vary between the two groups.

Based on this analysis, we conclude that all three groups had distinct sets of habitual activity patterns. Results indicate markedly different patterns of sexual division of labor associated with different subsistence economies. Comparison of the activity-related sexual dimorphism found in the two groups with known subsistence strategies does not easily resolve questions about Hopewell subsistence. However, this very lack of similarity may itself lend insight into Hopewell behavior.

Lip plug (bezote) abrasion facets in a Tarascan burial from Urichu, Michoacán.
L. CAHUE, N.J. SAUER and H.P. POLLARD, Department of Anthropology, Michigan State University, 354 Baker Hall, East Lansing, MI 48824

The Tarascan State emerged during the Postclassic period (A.D. 900 - A.D. 1520) in the Lake Patzcuaro Basin, in the modern state of Michoacan in West Mexico. State administrators were distinguished from the rest of society by the use of obsidian lip plugs (bezotes) given to them by the king. In 1574, Lagunas depicted the receipt of these lip plugs in his dictionary, and defined the verb *angámeni*: "to put in those lip plugs, which the king put in for the lords and men who were valiant in war, marking them with this nobility,..." As indicated in the 1541 *Relación de Michoacán* (RM), lip plugs were removed as the symbolic acts of punishment by the king, and the removal from office of state administrators (RM 1956).

A burial recovered during recent excavations at Urichu, a Tarascan elite administrative center in the Lake Patzcuaro Basin, was one of only two without associated elite artifacts (Cahue and Pollard 1997).

The skeletal analysis of this burial revealed the presence of abrasion facets on the labial surface of the mandibular incisors. These facets, like those described by Cybulski (1974), indicate that this individual wore a lip plug during life.

We suggest that this is an example of an individual who was removed from administrative office, losing the right to wear a lip plug. While this individual was buried in an elite center, the mortuary treatment he received was non-elite. This apparent contradiction suggests that, among the Tarascans, the use of elite burial goods is associated with social status at the time of death.

Body fat and pubertal development in rural African adolescent females.
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The development of obesity is related to four periods of human growth and development; the pre-natal period, infancy, adiposity rebound (5-7years) and adolescence. Recent evidence suggests that an increased prevalence of obesity during adolescence is more likely in females than males and may be related to the hormonal events surrounding menarche. However, the relationship between adolescent changes in body fat, and fat distribution, and other pubertal events in females, e.g. breast (B), and pubic hair (PH) development, have not been elucidated.

The current analysis investigated menarche, and changes in B, and PH in relation to increments in skinfolds (bicep (BCP), tricep (TRCP), subscapular (SSCP) and suprailiac (SPIL)), and Body Mass Index (BMI) in a group of 240 rural African adolescents. The participants were part of a mixed-longitudinal study in which anthropometric and pubertal assessments were made at 6 monthly examinations. Tanner's staging technique was used to assess pubertal status and menarcheal age was obtained prospectively examinations. Data were arranged so that the mean age at each change in pubertal status, i.e., B1-B2 to B4-B5, PH1-PH2 to PH4-PH5, and age at menarche, formed centring points about which changes in skinfolds and BMI were assessed for the 5 examinations (2.5 years) prior to and following the event.

The most dramatic incremental changes occurred in individual skinfolds and the sum of skinfolds, but not BMI, following B3-B4 and menarche. Gradual increases in skinfolds occurred throughout PH development with no single change being significant. Adolescent changes in subcutaneous fat appear to be strongly related to the pubertal events of menarche and B3-B4, both of which signal permanent hormonal changes resulting in adipose deposition. BMI does not reflect these changes and may thus be a poor indicator of fat deposition and subsequent obesity amongst adolescent females.

Testosterone predicts disease symptoms among Turkana males. B. CAMPBELL, W. LUCAS, M. TURNER, Northwestern University, Evanston IL 60208; KL CAMPBELL, UMass-Boston, MA 02215, PW LESLIE, University of North Carolina, Chapel Hill NC 27599.

The immunosuppressive effects of testosterone are thought to underly the relatively high levels of morbidity and mortality experienced by males. However little is known about testosterone's impact on males in non-Western populations, where poor nutritional status, and heavy disease burdens may increase the impact of testosterone-related immunosuppression on health.

We sought to explore this issue among the Turkana, of northwest Kenya. Hormonal measures, health status, and nutritional status were collected as part of a larger study of male reproductive ecology. Here we analyze data from a sample of 41 settled and 77 nomadic adult males for whom finger-prick testosterone values were available. Health complaints are based on local Turkana disease categories.

Based on logistic regression, higher testosterone levels were predictive of reports of symptoms, even when controlled for age and BMI, in 3 of 11 disease categories. All three such categories, chest infection, worms and "spleen", are indicative of chronic infection, consistent with testosterone as an immunosuppressive agent. The association of testosterone with reports of chest infection is of particular interest. A large proportion of these complaints may be related to TB, a disease in which immunosuppression plays a large role.

This work highlights the potential of local disease categories for the study of health and suggests that more attention be paid to the effects of testosterone immunosuppression among males in energetically-limited populations.

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MtDNA variation among the Western Anasazi. S.W. CARLYLE, University of Utah, Laboratory of Biological Anthropology.

The prehistoric Anasazi contemporaneously inhabited large portions of the US Southwest. While there is a uniform cultural entity known as "Anasazi", there is also evidence of archaeological regionalization. The origin and significance of such sub-divisions is unknown.

To clarify prehistoric population relationships in the Anasazi region, we have begun restriction site polymorphism (RSP) research to identify five (A, B, C, D, and E) maternal haplogroups known to be polymorphic in Native American populations. The haplogroups are defined by the presence or absence of four primary restriction sites and one length polymorphism (9 bp deletion).

Preliminary analysis of the distribution of these maternal haplogroups among two "regional" Anasazi populations (Grand Gulch, Utah, and Canyon del Muerto, Arizona) indicates that although both sub-groups are classified as "Western Anasazi" (Cordell 1979), they have significantly different distributions of the five haplogroups. Sample size is n=17 for the Grand Gulch "B" haplogroup, and n=8 for the other markers. Among the Muerto population, n=10 for the "B" haplogroup, and n=9 for the remainder.

Population	A	B	C	D	E
G. Gulch	.13	.18	.25	0	.25
del Muerto	0	.80	.11	0	0

Although conclusions are highly tenative due to the small sample sizes in the initial screen, results suggest that local Anasazi populations were perhaps more isolated than previously envisioned, and characterized by a frequent loss of mitochondrial lineages. However, the moderate to high frequency of haplogroup "B", and low frequency of lineage "A" are consistent with the pattern observed in modern Southwestern populations. This research supported by NSF grant BNS 89-20463.

A nonparametric analysis of the demographic representivity of the Maxwell Museum's Documented Skeletal Collection. E.A.CARSON, Department of Anthropology, University of New Mexico, 87131.

The relatively large amount of medical and demographic data available on many of the 207 individuals from the Documented Skeletal Collection of the Maxwell Museum's Laboratory of Human Osteology located at the University of New Mexico, renders the Collection an excellent control sample on which faculty, students, and guest researchers can investigate specific osteological questions. With Native American and Hispanic individuals comprising 21.05% and 9.94% of the Documented Collection, respectively, racial variation is greater than in comparable skeletal collections. While these data are helpful to anthropologists with defined sample goals and parameters, those who wish to examine the entire Documented Collection, or take a random sample of individuals need to be aware of the sample biases created by the demographic distribution of the Collection.

This study provides a summary of the race, age, and sex parameters of the Documented Collection, and compares these data to total mortality rates recorded in the State of New Mexico between 1984 and 1995. Full-sample and matched random-sample Kolmogorov-Smirnov and difference in mean ranks tests, iterated 10,000 times per test, examine the differences in the two mortality samples for combinations of these demographic parameters. Results show that while the distributions of sex, age, and race are significantly different when all individuals from the State of New Mexico mortality database are included in the analyses, random draws of mortalities from the New Mexico data do not deviate from the Documented

Collection's demographic distribution at either the 1% or 5% level of significance. Thus, the Documented Collection represents a random demographic sample of all mortalities in the State of New Mexico.

Laterality of hand and foot usage in Colobine monkeys. A.CARTER, Department of Anthropology, University of California at Berkeley, Berkeley, CA 94720.

The volume of data on handedness and laterality in non-human primates has grown steadily, yet there are few published studies involving Colobine monkeys. In an attempt to fill that gap, a year-long study was conducted on laterality of limb usage and body posture in three species of captive Colobine monkeys: *Presbytis entellus*, *Presbytis francoisi*, and *Colobus guerza*.

Four colony-living groups of subjects were given a variety of environmental stimuli which encouraged them to interact with their physical surroundings. Observers recorded the right and left limb use of individuals and postural changes of each individual. The correlations between groups as a whole, and between different types of stimuli across all three species will be presented.

The handedness of Colobines is especially interesting to study because of the extremely reduced (in some cases completely non-functional) thumb anatomy found in this taxon.

Sensitivity of Stable Isotopes in Bone to Dietary Specialization and Niche Separation of Primates in Kibale Forest, Uganda. M.L. CARTER, Illinois State Museum, Research and Collections Center, 1011 E. Ash St., Springfield, IL 62703.

This paper reports preliminary results from a study of the stable isotopic biogeochemistry of Kibale Forest National Park, a mid-altitude tropical rain forest. The ecology is a mosaic of habitats, including primary and secondary forest, grassland, swamp, and pine. The nutritional ecology of many Kibale primates has been studied for more than two decades. This project tested the hypothesis that stable isotopes of carbon and nitrogen in bone reflect local food web specializations differentiated by food type, quality, and microhabitat.

Bone and hair samples were obtained from Kibale primates, including Pan troglodytes (frugivore-omnivore; low canopy), Papio anubis (graminivore-omnivore; low canopy), Colobus badius (folivore; high canopy), Cercocebus albigena, and Cercopithecus ascanius (both frugivores; middle canopy). Nonprimates sampled were bushbuck, bush pig, water buffalo, and duiker. Plant and soil samples from specific microhabitats were analyzed.

Mean ∂13C values of bone collagen demonstrated significant differences between primates that feed in different canopy levels. Rainforest primates mainly feed on C3 plants, but they also consume C4 plants, namely elephant grass (pith) and crop foods (corn, sugar cane). Consumption of C4 plants did not affect bone chemical signatures. Mean ∂15N values of primate collagen were higher than predicted for forest herbivores. ∂15N values did not reflect the percentage of animal flesh in the diet, but may indicate consumption of legumes. Given the complexity of local dietary variability, the results suggest that interpretations of bone chemical data must be refined prior to the analysis of stable isotopes in fossil fauna.

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Support of the "Out-of-Africa" theory of evolution of Modern humans from microsatellite polymorphisms. R. CHAKRABORTY[1], M. KIMMEL[2] and R. DEKA[3]. [1]Human Genetics Center, Univ. Texas School of Public Health, Houston, TX 77225; [2]Statistics Dept., Rice University, Houston, TX 77251; [3]Dept. Human Genetics, Univ. Pittsburgh, Pittsburgh, PA 15261.

Previous studies on mitochondrial genetic diversity as well as haplotypic diversity at specific locations of the nuclear genome provide genetic evidence of the "Out-of-Africa" theory of evolution of modern humans. Microsatellite loci, because of their characteristic distinct mutation patterns of alleles, provide opportunity for an independent assessment of this theory, which is the basic objective of this research.

Since new alleles arise at microsatellite loci either by contraction or expansion of progenitor alleles, first, we show that under a generalized stepwise mutation model appropriate measures of genetic distance can maintain a monotone relationship with evolutionary time of divergence. Using this theory, allele size data on 24 microsatellite loci provide evidence that the populations of African descent are separated from those residing elsewhere in the world with the largest genetic distance, suggesting the antiquity of African populations.

Second, using measures based on heterozygosity and allele size variance, we develop an index that relates to population size expansions. Application of this index to allele size data on 60 tetranucleotide loci shows that African populations demonstrate a more conspicuous effect of expansion compared to the Asians and Europeans.

Third, using two linked markers (the CTG-repeat and a bi-allelic *Alu*-insertion/deletion site at the DMPK gene), we find evidence that the linkage disequilibrium between sites is comparatively weaker in Africans as compared with non-Africans, but the haplotypic diversity in the Africans is larger. In combination, these three features of repeat polymorphisms support the "Out-of-Africa" theory, and speak against the multi-regional evolution of modern humans. (Research supported by NIH grants GM 41399, GM 45861, and GM 58545).